

CLAIMS

1. An antenna device (1,1',1''), comprising:
 - at least one sheet-shaped support (2) which is folded along at least one fold-line (3-8,80-83), said support (2) including:
 - at least one first support plane (10-13) adjacent to at least one of said fold-lines (3-8,80-83), which first support plane (10-13) has at least one first antenna structure (100) arranged for receiving or emitting electro-magnetic radiation;
 - at least one second support plane (10-13) adjacent to at least one of said fold-lines (3-8,80-83), which second support plane (10-13) is positioned at an angle with respect to the first support plane (10-13) and which second support plane (10-13) has at least one second antenna structure (100) arranged for receiving or emitting electro-magnetic radiation.
- 15 2. An antenna device (1,1',1'') as claimed in claim 1, wherein
 - at least one of the first antenna structures (100) is arranged for receiving or emitting electro-magnetic radiation of a first polarisation; and wherein
 - at least one of the second antenna structures (100) is arranged for receiving or emitting electro-magnetic radiation of a second polarisation different from said first polarisation.
3. An antenna device (1,1',1'') as claimed in claim 1 or 2, wherein the support (2) is folded along at least two fold-lines (3-8,80-83), and further comprises a base plane (15,15a,15b) adjacent to a side of a fold-line (3-8,80-83), at least one of the first and second support plane (10-13) being adjacent to another side of that fold-line (3-8,80-83);
 - said base plane (15,15a,15b) being positioned at an angle with respect to the first and second support plane (10-13).
- 30 4. An antenna device (1,1',1'') as claimed in any one of the preceding claims, wherein the support (2) comprises an electrically isolating layer (20,21).

5. An antenna device (1,1',1'') as claimed in claim 4, wherein the electrically isolating layer (20,21) is made of a flexible material.
6. An antenna device (1,1',1'') as claimed in claim 4 or 5, further comprising:
 - 5 a first electrically conducting layer (22) at a first side of the electrically isolating layer (20,21).
 - and an electrically conducting layer (23) at a second side of the electrically isolating layer (20,21) shaped into a feed (102).
- 10 7. An antenna device (1,1',1'') as claimed in claim 4,5 or 6, further comprising a second electrically conductive layer (24) at the second side of the electrically isolating layer (20,21) shaped into connecting lines (105) for transmitting signals from or to the antenna structure (100).
- 15 8. An antenna device (1,1',1'') as claimed in claim 7, wherein the feed (102) lies between a first electrically isolating layer (20) and a second electrically isolating layer (21), and wherein the connecting lines (105) are present at a side of the second electrically isolating layer (21) facing away from the first electrically isolating layer (20).
- 20 9. An antenna device (1,1',1'') as claimed in claim 3 and any one of claims 6-8, wherein the first conducting layer (22) extends at least partially over at least a part of the base plane (15,15a,15b).
- 25 10. An antenna device (1,1',1'') as claimed in any one of claims 6-9, further comprising an amplifier element (103) positioned at the second side, which amplifier element (103) is electrically connected with a signal input to the feed (102) and is connected with a reference input to a ground (104).
- 30 11. An antenna device (1,1',1'') as claimed in any one of claims 6-10, wherein the first conducting layer (22) is used as ground (104).

12. An antenna device (1,1',1") as claimed in any one of the preceding claims, wherein the antenna structures (100) include flat antennas.

13. An antenna device (1,1',1") as claimed in claim 12, wherein the antenna structures (100) include vertical antennas.

14. An antenna device (1,1',1") as claimed in claim 13, wherein the antenna structures (100) include tapered slot antennas.

10 15. An antenna device (1,1',1") as claimed in any one of the preceding claims, wherein the support (2) is folded along at least one of said fold-lines (3-8,80-83) such that at least one of the first support plane (10-13), the second support plane (10-13), and the base plane (15,15a,15b) is positioned substantially perpendicular to at least one of the other planes.

15 16. An antenna device (1,1',1") as claimed in claim 3 and any one of the preceding claims, wherein the base plane (15,15a,15b) is substantially rectangular, said first support plane (10-13) is positioned at a first side of the rectangular base plane (15,15a,15b) and said second support plane (10-13) is positioned at a second side of the rectangular base plane (15,15a,15b) transverse to the first side.

17. An antenna device as claimed in any one of the preceding claims, wherein the support plane is folded to a sleeve-like shape.

25 18. An antenna device as claimed in any one of the preceding claims, wherein at least one of the antenna structures is connectable to further signal processing devices outside the antenna device via a non-contact connection, such as a capacitive or an inductive connection.

30 19. An antenna array (30) comprising at least two antenna devices (1',1") as claimed in any one of the preceding claims.

20. An antenna array (30) as claimed in claim 19, comprising at least one sheet shaped support member (200,201) which is folded along at least two fold-lines (3-8,80-83) to obtain at least two antenna devices (1,1',1'') as claimed in any one of claims 1-17.

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21. An antenna array as claimed in claim 20, wherein the sheet shaped supports (200,201) are connected to each other at or close to at least one of the fold-lines (3-8,80-83).

10 22. An intermediate product (40) for an antenna device (1,1',1'') and/or an antenna array (30) as claimed in any one of the preceding claims, comprising:

a sheet shaped support (2,200,201) with a first structure and a second structure, which sheet shaped support (2,200,201) is foldable along a fold-line, by means of which folding a first support plane (10-13) with said first structure and a second support plane (10-13) with said second structure can be obtained, which first structure and second structure after folding the support (2,200,201) form at least a part of the first and second antenna structures (100).

15 23. A method for manufacturing an antenna device (1,1',1'') or an antenna array as claimed in any one of claims 1-21, comprising:

20 folding at least one sheet shaped support (2,200,201) provided with at least two antenna structures (100) along at least one fold-line, such that

25 at least one first support plane (10-13) adjacent to at least one of said fold-lines (3-8,80-83), which first support plane (10-13) has at least one first antenna structure (100) arranged for receiving or emitting electro-magnetic radiation;

30 at least one second support plane (10-13) adjacent to at least one of said fold-lines (3-8,80-83), which second support plane (10-13) is positioned at an angle with respect to the first support plane (10-13) and which second support plane (10-13) has at least one second antenna structure (100) arranged for receiving or emitting electro-magnetic radiation which differs in at least one property from the electro-magnetic radiation which can be received or emitted by said first antenna structure (100).